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Use of fitness trackers to determine the volume of physical activity of students in secondary schools aged 15–16 years

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Purpose: *determine the weekly volume of motor activity of pupils of general education schools aged 15–16 in Lviv.*

Material & Methods: *analysis of scientific and methodological literature, analysis and synthesis, determination of the volume of physical activity using technology FitnessTracker, methods of mathematical statistics. The study was attended by students of secondary schools No.45 and No. 54 (Lviv). For further processing, the results of the 26th boys and 25 girls were recorded. The total number of students was 51 people.*

Results: *presents results of fixation of indicators of motor activity of children 15–16 years. The average number of steps that are carried out by students of this age on weekdays and weekends.*

Conclusions: *it is established that on average, pupils of the specified age perform 7185,1 steps per day. This indicator is below the recommended standards for children of this age. Indicators of daily physical activity among children were higher than among women. It is established that the volume of physical activity of children 15–16 years old is 8,2% more on weekends compared with the same indicator on weekdays.*

Keywords: *physical activity, fitness tracker, free time, students*.

Introduction

One of the main negative factors affecting the child's body during school is the low level of physical activity. The sedentary, or so-called "sedentary" lifestyle, is a generally recognized negative factor and is consistently associated with an increased risk of developing chronic diseases and mortality [10; 15]. The decrease in the volume of motor activity is often due to the fact that children of different ages choose sedentary methods of spending free time [12].

Over the past 10 years of the 21st century, the pace of decline in the quality of health of school-age children and adolescents has accelerated. One of the reasons for this is a decrease in the level of daily physical activity among school-age children [5]. According to the results of analytical studies, it was established that for a positive effect on the body, children and young people aged 5 to 17 years should be involved in moderate physical activity from an average of less than 60 minutes to several hours per day. Moderate physical activity on average 30 minutes per day can also have a certain positive effect on health in some cases [14].

Among the modern approaches to improve the motor activity of students, experts highlight the use of the latest information technology tools [3]. These tools include compact fitness trackers.

Modern fitness tracker is able to perform a number of functions. With among other functions, it allows you to count the number of steps, calculate distance and calories burned, calculate heart rate, monitor sleep [6]. The potential benefits of mobile fitness trackers include the ability to motivate a person to lead a healthy lifestyle, develop a community of like-minded people who seek to improve their health and also help create a lasting environment for long-term advancement of health-saving technologies [9]. In addition, data collected using fitness trackers, smartphones or smart hours is already used as ancillary to treat certain disorders [11].

Problems of motor activity of school-age children constantly become the object of study in domestic and foreign scientific research. In addition, the value of motor activity is considered in different contexts. Among them we recall the study of factors of a healthy lifestyle as components of the individual physical culture of contemporary schoolboys author Oksana Marchenko, in which motor activity is considered one of the components of a value relation to their own health [2].

Studies by authors A. Tomenko and S. Matrosov, aimed at studying differences in indicators of somatic health, physical activity, theoretical readiness and motivational and value sphere of high school students, showed a difference in the level of physical activity among pupils of senior school age with regard to gender differences. According to the index of motor activity, the results of boys were dominated by girls [8].

Irina Novikova, in her research, proves that fitness gadgets are a promising direction in the field of physical education and create optimal conditions for the implementation of comprehensive monitoring of physiological indicators of human life activity and its physical improvement and development [4].

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Today, mobile fitness tracker technologies are widely used to monitor the level of physical activity of various social and age groups. In modern scientific research, this technology is used both in studies of the motor activity of schoolchildren and adults, and in determining the motor activity of special groups, in particular, children with cancer. Related research by Mary Hooks [13].

Stephen Wright et al. analyzed the features of today's most popular devices and programs that allow monitoring of human performance, and found that such devices are an effective tool for studying the physiological characteristics of the body [15].

At the same time, in modern scientific research problems of motor activity in Ukraine, fitness trackers and other mobile devices are used very rarely. This may be due primarily to the cost of these devices and their insufficient prevalence among certain populations.

Purpose of the study: determine the weekly volume of motor activity of pupils of general education schools aged 15–16 in Lviv.

Objectives of the study:

1. Set the average number of steps performed by pupils of older school age during the day.
2. To identify differences in indicators of the volume of physical activity on weekdays and weekends.

Material and Methods of the research

The study was attended by students of secondary schools number 45 and number 54 (Lviv). For further processing recorded the results of 26 boys and 25 girls. The total number of students was 51 people.

The fixation of the results was carried out in a period that did not cover the time of the holidays and which did not have a state weekend. Another feature of the study was that the parameters of physical activity were recorded during periods of the year when the air temperature exceeded 15°C, namely at such a time: the second half of April – May and September – the first half of October.

The indicated periods of the year are chosen because they are most favorable for the exercise of motor activity in their spare time outside the educational institution. Such an approach, in our opinion, allowed us to avoid the potential negative impact of the factor of adverse weather conditions.

The results recorded by the fitness tracker were analyzed using a special Mi Fit application that can be installed on any modern smartphones. Using the application, the bracelet was synchronized with the corresponding smartphone and transmitted via Bluetooth all the necessary data. The children simply wore a bracelet for a week, without fulfilling any additional conditions, after which the necessary information was received on their own smartphones.

Research methods: analysis of scientific and methodological literature, analysis and synthesis, determination of the volume of physical activity using the Fitness Tracker, methods of mathematical statistics.

Results of the research

Using the fitness tracker Xiaomi Mi Band, it was established that the volume of motor activity of students aged 15–16 years during the school week was 50295,5 steps. Among young men, this figure was 50,580,7 steps, among girls – 49998,8 steps (Figure 1).

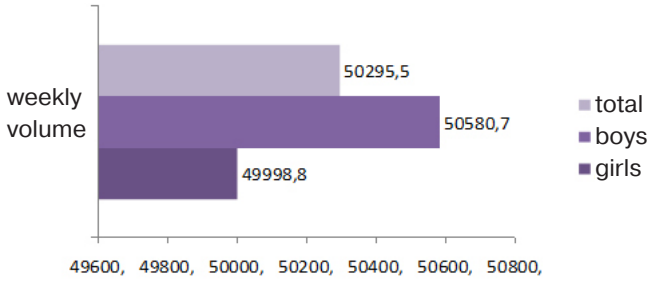

Fig. 1. Weekly volume of motor activity of pupils aged 15–16 years old, X±s=50295,5±413,7 (steps, n=51)

The average daily volume of motor activity in boys was 7225,8 steps and was 83 steps more than that of girls, which was 7142,7 steps (Figure 2).

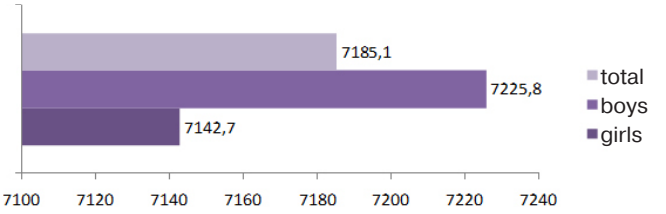

Fig. 2. Average number of steps that pupils carry out during the day is 15–16 years old, X±s=7006,6±59,7 (steps, n=51)

Analysis of motor activity, taking into account the factor of training and weekends, showed that the volume of motor activity among girls and boys was large at the weekend. Among young men, the average daily number of steps at the weekend was 328.3 steps higher than on weekdays and amounted to 7460,3 steps. Among girls, the same indicator was 7522,1 steps. The total daily number of steps among pupils aged 15–16 on weekdays was 7006,6 steps, and 7613,3 steps on weekends (Table 1). Interestingly, in this age group of students, the indicators of motor activity on weekends were higher among girls than among boys.

Figure 3 shows the change in the daily volume of motor activity of students in a specified age group during the week.

As can be seen from the figure, among young men, the indi-

Table 1

Indicators of motor activity of pupils in general education schools aged 15–16 on weekdays and weekends

Volume MA	Boys (n=26)		Girls (n=25)		Total (n=51)	
	Weekdays	Weekends	Weekdays	Weekends	Weekdays	Weekends
In general steps	927164	387935	859519	390450	1786683	778385
Steps per day	7132	7460,3	6876,2	7522,1	7006,6	7631,2
X±s	7132±83,5	7460,3±154,4	6876,2±78,9	7809±186,3	7006,6±59,7	7631,2±121,9

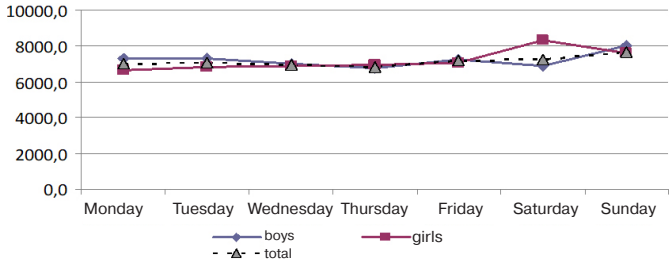

Fig. 3. Dynamics of motor activity during the week among pupils of secondary schools aged 15–16 years

Table 2

Indicators of the coefficient of variation of motor activity of pupils of comprehensive schools aged 15–16 years

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Boys	10,2%	12,1%	10,9%	9,2%	14,7%	13,2%	20,1%
Girls	12,7%	10,4%	12,9%	14,2%	13,8%	15,5%	23,9%
Total	12,4%	11,8%	11,8%	12%	14,2%	17,4%	22,2%

cators of physical activity on weekdays were higher on Monday and Tuesday, making 7327,9 and 7332,1 steps, respectively. During the school week, physical activity among young men declined, reaching the lowest level on Thursday (6749,8 steps). The increase in motor activity indicators among boys at the weekend was primarily due to the growth of this activity on Sunday. This day recorded the highest level of motor activity, which amounted to 8025,4 steps.

Among girls, the dynamics of changes in motor activity indicators during the school week was somewhat different. Indicators gradually grew, starting from Monday, reaching the highest value on Saturday (8342,8 steps).

Analysis of the obtained indicators using the methods of mathematical statistics showed mainly the average variability of the data. If on weekdays, the coefficient of variation values were close to 10%, which indicated weak variability, then at the output the coefficient of variation of the data grew to more than 20% (Table 2).

In our opinion, these indicators of the coefficient of variation indicate significant differences, both in general in the structure of the daily routine, and, in particular, in the structure of the motor activity of students on weekends. The increase in the amount of free time and non-binding forms of activity allows students of this age to be attracted to various forms of leisure, while increasing the difference in the time spent on physical activity.

Conclusions / Discussion

It was established that under optimal weather conditions among students aged 15–16 years, the indicators of physical activity during the school week were 50295,5 steps. Among boys this indicator was higher, reaching 50580,7 steps, among girls – 49998,8 steps.

The average daily volume of motor activity in boys was 7225,8 steps and was 83 steps more than that of girls, which was 7142,7 steps. The average number of steps in this group of students was 7185,1 steps per day.

Daily motor activity on weekends was higher compared to weekdays at 624.6 steps. On weekdays, pupils of high school age performed an average of 7006,6 steps per day, on weekends – 7631,2 steps per day.

The obtained data showed the urgency for Ukraine of the global tendency to decrease the volume of motor activity among pupils of the senior school. Low indicators of the volume of motor activity on weekdays show the negative impact of compulsory activities, primarily on the educational, on the general motor condition of schoolchildren of this age.

The results obtained also confirm the research data of domestic authors, show a change in priorities in the choice of activities at leisure among pupils of different ages towards sedentary activities [1; 7].

Prospects for further research is to determine the current norms of the volume of motor activity, which was measured in steps. In addition, an important task is the creation of objective models of motor activity of pupils of different ages, allowing to determine effective ways of organizing the daily and weekly modes of activity.

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References

1. Marchenko, Oksana (2018), "Characteristic differences in the choice of factors of a healthy lifestyle as part of the individual physical culture of modern schoolchildren", *Slobozans`kij naukovo-sportivnij visnik*, No. 6(68), pp. 10-15, doi:10.15391/snsv.2018-6.002. (in Ukr.)
2. Moskalenko, N., Reshetilova, V. & Mihaylenko, Yu. (2018), "Modern approaches to increase motor activity of school-age children", *Sportivniy vlsnik Pridnlprov'ya: naukovo-praktichniy zhurnal*, No. 1, pp. 203-208. (in Ukr.)
3. Novikova, I.V. (2018), "Application of Information Technologies in the Field of Physical Education", *Aktualnyie nauchnyie issledovaniya v sovremennom mire*, No. 1(33), P. 3, pp. 90-94. (in Ukr.)
4. Nosko, M.O., Garkusha, S., Voedilova, O., Nosko, Yu. & Grishko, L. (2017), "Out-of-school healthcare-saving activity in physical education as a way to improve motor activity and improve the condition Health of participants in the educational process", *Visnik Chernigivskogo Natsionalnogo Pedagogichnogo Universitetu*, No. 147, P. 2, pp. 86-90. (in Ukr.)
5. Overview: Xiaomi Mi Band 1S – Update the Most Popular Fitness Trainer (2016), available at: http://lifehacker.ru/2016/01/21/obzor-xiaomi-mi-band-1s/ (accessed 14.01.16). (in Russ.)
6. Tomenko, O. & Matrosov, S. (2018), "Differences in indicators of somatic health, motor activity, theoretical preparedness and motivational-value sphere of senior pupils and students depending on sex", Pedagogichni nauki: teoriya, istoriya, innovatsiyni tehnologiyi : naukoviy zhurnal, No. 9(83), pp. 113-123. (in Ukr.)
7. Ahuja Neera, Ozdalga Errol, Aaronson Alistair (2017), "Integrating mobile fitness trackers into the practice of medicine" , *American Journal of Lifestyle Medicine*, No. 11.1, pp. 77-79.
8. Ekelund, U., Steene-Johannessen, J., Brown, W.J., Fagerland, M.W., Owen, N. & Powell, K.E. (2016), "Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women", *The Lancet*, No. 10051, pp. 1302-1310.
9. Henriksen, Andrйl (2018), "Using fitness trackers and smartwatches to measure physical activity in research: analysis of consumer wrist-worn wearables", *Journal of medical Internet research*, No. 20.3, pp. e110.
10. Hills, Andrew P, Dengel, Donald R. & Lubans, David (2015), "Supporting public health priorities: recommendations for physical education and physical activity promotion in schools", *Progress in cardiovascular diseases*, No. 57.4, pp. 368-374.
11. Hooke, Mary C. (2016), "Use of a fitness tracker to promote physical activity in children with acute lymphoblastic leukemia", *Pediatric blood & cancer*, No. 63.4, pp. 684-689.
12. Janssen, Ian & Leblanc, Allana G. (2010), "Systematic review of the health benefits of physical activity and fitness in school-aged children and youth", *International journal of behavioral nutrition and physical activity*, No. 7.1, pp. 40.
13. Wright, Stephen P. et al. (2017), "How consumer physical activity monitors could transform human physiology research", *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, No. 312.3, pp. R358-R367.

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